THE IRVINE TRANSPORTATION ANALYSIS MODEL (ITAM)

Past, Present , and Future

By

City of Irvine
Advanced Transportation Division
Department of Public Works

Presented at the SCAG Modeling Task Force Meeting – September 28, 2005

VICINITY MAP

THE CITY PROFILE

- Incorporated on December 28, 1971;
- Has a Charter Law, and City Council-City Manager form of government;
- City incorporated area: 58 square miles;
- Sphere of influence area: 74 square miles;
- Is the largest city in Orange County;
- 2005 population: 175,000;
- 2005 employment: 168,000;
- Circulation system: 1,664 lane miles.

THE IRVINE TRANSPORTATION ANALYSIS MODEL (ITAM)

- Past
- Present
- Future

ITAM VERSIONS TO DATE

- 1977-1984: Traffic Analysis Program (TAP);
- 1984-1993: Irvine Transportation Analysis Program (ITAP);
- 1993-2001: Irvine Transportation Analysis Model (ITAM); and
- 2001-Present: Irvine Transportation Analysis Model 3.01 (ITAM 3.01).

"WINDOWED" VS. "FOCUSED" MODELS

"Windowed" model

- It extracts the subarea and sets it up as a separate model;
- It maintains its consistency with regional model's forecasts for trips that enter and leave the subarea at cordon stations.

"Focused" model

- It focuses the subregional area by adding details to the subarea within the regional model framework;
- It reduces the number of zones and links outside of study area.

"SOCIOECONOMIC" VS. "LAND USE" TRIP GENERATION MODELS

"Socioeconomic-Based" Model

- Trip production rates are based on dwelling units;
- Trip attraction rates are based on employment;
- Trip lengths and rates are calibrated to Origin-Destination (O-D) survey data.

"Land Use-Based" Model

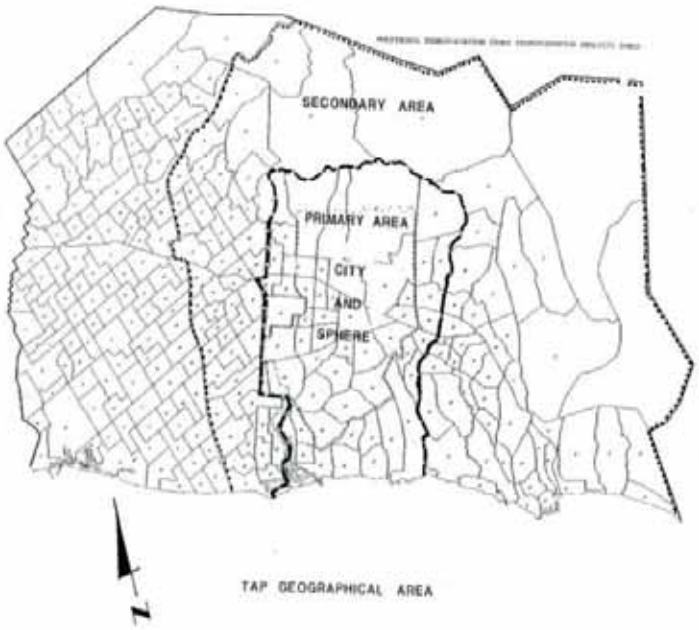
- Trip production rates are based on dwelling units;
- Trip attraction rates are based on square footage;
- Trip lengths are shortened to account for underreporting of shorter trips in O-D survey data.

TAP (1977-1984)

- Was initiated to test the compatibility of the General Plan's Land Use and Circulation Elements;
- Was a window-based model;
- Used land use data to generate trips;
- Ran on the Unix Mainframe Computer.

TAP (1977-1984, Continued)

- Based on the Los Angeles Regional Transportation Study (LARTS) model;
- Was a three-step model: trip generation, trip distribution and trip assignment;
- Used peak and offpeak assignments.

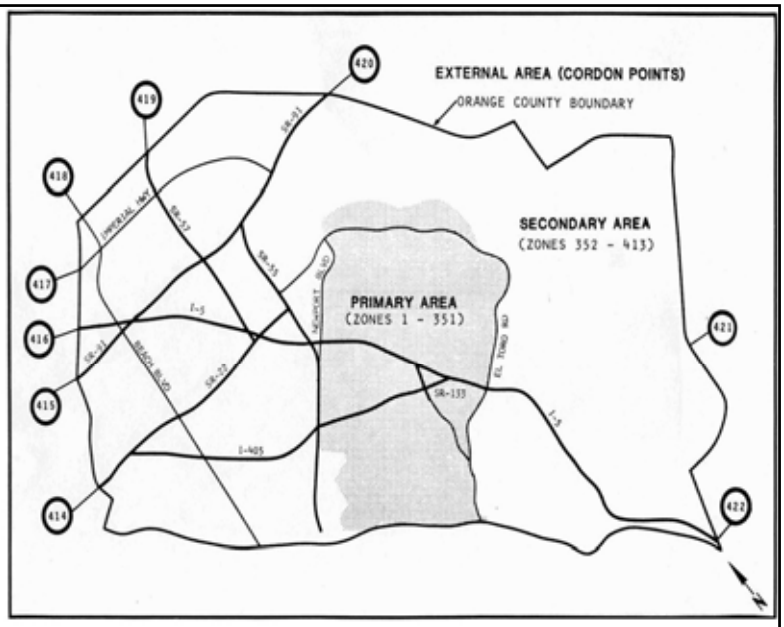


TAP TRIP PURPOSES

- Home to Work;
- Home to Shopping;
- Home to Others;
- Non-Home Based.

ITAP (1984-1993)

- The shift from TAP to ITAP was prompted by the computer technology improvement from mainframe to PC;
- Based on the South Orange County Circulation Study;
- Was a window-based model developed and installed on IBM PC microcomputer system in 1984;
- Used land use data to generate trips with the following TAZ system:
  - Primary Area: City of Irvine and area of influence, zones 1-351;
  - Secondary Area: Remainder of Orange County zones 352-413;
  - Cordon stations: zones 414-422.
- Used peak and offpeak assignments.



ITAP TRIP PURPOSES

- Home to Work;
- Home-Based Non Work (combining the original Home to Shopping and Home to Others trip purposes together);
- Non-Home Based.

ITAP MODELING PROCEDURES

- Trip generation;
- Trip distribution; and
- Trip assignment.

ITAM (1993-2001)

- The shift from ITAP to ITAM was prompted by the desire to add transit modeling capability to the model;
- The transit assumptions of the model were based on the Countywide Rail Study (Orange County) in 1991;
- Included regional component, which contained socioeconomic data and mode choice submodel;
- Included local component, which contained land use data, and subarea window;
- Local cordon trips were extracted from the regional component.

ITAM TRIP PURPOSES

- Home to Work;
- Home-Based Non Work;
- Non-Home Based.

REGIONAL COMPONENT OF ITAM

- The regional component was derived from the Orange County model;
- The socioeconomic data was revised for the Irvine Primary Modeling Area.

LOCAL COMPONENT OF ITAM

- The local component was a “windowed” model, with approximately 600 zones covering the City and sphere area. The zones were subsets of Orange County model zones;
- The local component used land use data to generate person trips; and
- Regional vehicle occupancy factors were applied to person trips to calculate vehicle trips.

ITAM 3.01 (2001-PRESENT)

- The shift from ITAM to current ITAM 3.01 was prompted by the consistency requirement with the “Orange County Subarea Modeling Guidelines Manual” adopted by the Orange County Transportation Authority (OCTA) in 1998;
- It represented the most recent comprehensive update to the traffic model structure employed by the City;

ITAM 3.01 (2001-PRESENT, CONT.)

- ITAM 3.01 was certified to be consistent with regional model by OCTA in 2003, and it remains consistent today;
- The ITAM databases have been updated periodically, as new knowledge regarding development patterns and roadway improvements becomes available.

ROADWAY NETWORK REPRESENTATION

The ITAM 3.01 network coding procedure follows the OCTAM 3.01 coding conventions in terms of facility types, area types, and speed/capacity assumptions.

LAND USE (LU)/SOCIOECONOMIC DATA (SED) CONVERSION FACTORS

- The City of Irvine maintains comprehensive land use databases;
- Conversion factors from LU to SED are calibrated to match the regional SED for the City.

TRIP GENERATION

The approach taken for the ITAM 3.01 is to convert land use to SED and generate traffic that is consistent with the regional trip generation estimates.

TRIP PURPOSES

- Home-Work;
- Home-Elementary / High School;
- Home-Other;
- Other-Work; and
- Other-Other.

TRIP DISTRIBUTION

- Trips from the regional trip table are aggregated into analysis districts. Based on changes in local land use, growth factors based on socioeconomic trip rates are developed for each district and applied to the compressed trip tables;
- The compressed and factored regional trip tables are disaggregated to ITAM TAZs through a factoring process based on ITAM socioeconomic trip generation developed for each zone.

TIME OF DAY FACTORING

- The time-of-day factoring is consistent with the regional time-of-day factoring;
- Four time periods include:
  - morning peak (6:00 AM – 9:00 AM);
  - midday off-peak (9:00 AM – 3:00 PM);
  - evening peak (3:00 PM – 7:00 PM); and
  - night off-peak (7:00 PM – 6:00 AM).

TRAFFIC ASSIGNMENT

- Traffic is assigned separately for AM, midday, PM, and nighttime periods using equilibrium highway assignment modules;
- Traffic is assigned to the roadway system on the basis of minimum travel time and cost;
- 25 iterations are conducted for peak period assignments.

POST-PROCESSING PROCEDURES

- Post-processing is performed to use existing count data to prepare the best possible estimate of future traffic conditions;
- Refined ADTs and peak hour street intersection turning movement volumes are main products of post-processing procedures.

REQUIREMENTS OF OCTA'S "ORANGE COUNTY SUBAREA MODELING GUIDELINES MANUAL"

- Promote consistency in transportation modeling within Orange County;
- Local subarea models in Orange County are required to be consistent with OCTAM;
- Consistency is also prompted by requirements of state and federal legislation including CMP, TEA-21, and both federal and state Clean Air Acts.

CONSISTENCY DETERMINATION

- Trip Generation;
- Trip Distribution;
- Mode Choice; and
- Trip Assignment
  - Control Point Validation;
  - Screenline Validation.

ITAM 3.2 (FUTURE)

- The City of Irvine will launch a new round of modeling improvements to update ITAM model;
- The new ITAM model will be based on the newly approved OCTAM 3.2; and
- The modeling improvements will take about one year to complete.

ITAM 3.2 NEW FEATURES

- The new ITAM model will include new mode choice/transit assignment procedures;
- The model will have more TAZs and finer networks than OCTAM 3.2.

LIST OF TASKS

- Update traffic counts;
- Revise land use-socioeconomic data conversion factors and trip rates;
- Revisit trip distribution adjustment factors, speed-capacity curves, and others;
- Recode highway and transit networks;
- Incorporate transit modeling;
- Calibrate and validate model; and
- Update modeling documentation and user manual.


IRVINE
THANK YOU!